

Vibrational Spectra of Liquids and Solutions Under High Pressure

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Study of the allowed and forbidden transitions in vibrational spectra under high external pressures and temperatures allows one to obtain new information on intra- and intermolecular processes in condensed media.

We have measured and calculated frequencies, widths and intensities of the induced bands of single and simultaneous transitions in IR and Raman spectra for a series of liquids and solutions under pressures up to 1000 MPa, and at various temperature (240-475K). With rising pressure we revealed the broadening of the polarized lines and decrease of the width of depolarized lines in Raman spectra of the studied liquids, as well as a weak increase of their frequencies. With rising pressure we observed the decrease of the integral intensity of most Raman lines and the induced single IR bands in the absorption spectra of the studied systems. At the same time the intensities of bands of the simultaneous vibrational transitions (one photon is absorbed by two molecules simultaneously) in the absorption spectra of liquids and solutions at the same conditions remain practically invariable. A correlation between the parameters of Raman lines and the parameters of bands of simultaneous vibrational transitions is revealed in spectra of the studied substances.

The results are discussed in terms of existing theories and ideas.